

1,1,2,2-TETRACHLOROETHANE

1,1,2,2-Tetrachloroethane is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 79-34-5



Molecular Formula: $\text{C}_2\text{H}_2\text{Cl}_4$

1,1,2,2-Tetrachloroethane is a nonflammable, heavy mobile liquid with a sweetish, suffocating, chloroform-like odor. It is miscible with methanol, ethanol, benzene, ether, chloroform, carbon tetrachloride, dimethylformamide, carbon disulfide, and oils, and is slightly soluble in water. It has the highest solvent power of the chlorinated hydrocarbons (Merck, 1983).

Physical Properties of 1,1,2,2-Tetrachloroethane

Synonyms: tetrachloroethane; sym-tetrachloroethane; acetylene tetrachloride; Cellon; Bonoform

Molecular Weight:	167.86
Boiling Point:	146.5 °C
Melting Point:	-36 °C
Vapor Density:	5.79 (air = 1)
Density/Specific Gravity:	1.58658 at 25/4 °C (water = 1)
Vapor Pressure:	6.1 mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	2.39
Water Solubility:	2962 mg/L at 25 °C
Henry's Law Constant	4.55×10^{-4} atm-m ³ /mole at 25 °C
Conversion Factor:	1 ppm = 6.86 mg/m ³

(Howard, 1990; HSDB, 1991; Merc, 1983; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

1,1,2,2-Tetrachloroethane is used in the manufacture of trichloroethylene and perchloroethylene, as a metal degreasing agent, in paint, in varnish, in rust removers, in photographic film, as an alcohol denaturant, as an extractant, as a solvent, and as a chemical intermediate (Sax, 1989).

The primary sources that have reported emissions of 1,1,2,2-tetrachloroethane compounds in California are aircraft and aircraft parts manufacturers (ARB, 1997b).

B. Emissions

The total emissions of 1,1,2,2-tetrachloroethane from stationary sources in California are estimated to be at least 1,200 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

1,1,2,2-Tetrachloroethane is not known to occur as a natural product (Howard, 1990).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of 1,1,2,2-tetrachloroethane. However, the United States Environmental Protection Agency (U.S. EPA) has compiled ambient air data from several locations throughout the United States from 1976-86. A mean concentration of 0.49 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) or 0.07 parts per billion was reported from this data (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

Indoor concentrations of 1,1,2,2-tetrachloroethane are probably very low in most buildings. In the summer season of the 1987 Total Exposure Assessment Methodology study of 34 homes in Los Angeles, all 34 indoor air samples measuring 1,1,2,2-tetrachloroethane were below quantifiable limits (Pellizzari et al., 1989). The quantifiable limits were 0.44 to 1.92 $\mu\text{g}/\text{m}^3$. Study results from three different commercial buildings on the East coast indicated that indoor concentrations of 1,1,2,2-tetrachloroethane were well below 1.0 $\mu\text{g}/\text{m}^3$ (Sheldon et al., 1988a).

ATMOSPHERIC PERSISTENCE

Based on the measured rate constants (see Atkinson, 1994), the half-life of 1,1,2,2-tetrachloroethane in the troposphere is estimated to be about three months (Atkinson, 1995). Due to its persistence, it will disperse over long distances and slowly diffuse into the stratosphere where it would be rapidly degraded (Howard, 1990).

AB 2588 RISK ASSESSMENT INFORMATION

Since no emissions of 1,1,2,2-tetrachloroethane from stationary sources in California have been reported under the AB 2588 program, it was not listed in any of the risk assessments reviewed by the Office of Environmental Health Hazard Assessment.

HEALTH EFFECTS

Probable routes of human exposure to 1,1,2,2-tetrachloroethane are inhalation and dermal contact.

Non-Cancer: 1,1,2,2-Tetrachloroethane is a potent hepatotoxicant. Acute exposure by inhalation has resulted in toxic effects on the respiratory, central nervous, and gastrointestinal systems (U.S. EPA, 1994a). 1,1,2,2-Tetrachloroethane can cause irritation and tearing of the eyes. Obese individuals may be abnormally susceptible (HSDB, 1991). Chronic exposure by inhalation may cause jaundice, liver enlargement, headaches, tremors, dizziness, numbness, loss of appetite, nervousness, and drowsiness. Earliest and most common symptoms of dermal exposure are tremors of the hands, followed by skin irritation, numbness and the effects listed above. Death has occurred from a combination of inhalation and skin absorption. Ingestion can cause abdominal pain, nausea, vomiting and symptoms similar to those from inhalation.

The U.S. EPA has not established a Reference Concentration (RfC) for 1,1,2,2-tetrachloroethane, but an oral Reference Dose is under review (U.S. EPA, 1994a).

No information is available on inhalation or oral reproductive studies in humans. Although adverse reproductive effects from inhalation exposure have not been reported in animal studies, there is limited evidence of adverse effects on the male reproductive system in rats through the oral pathway (U.S. EPA, 1994a).

Cancer: The U.S. EPA has classified 1,1,2,2-tetrachloroethane in Group C: Possible human carcinogen. The U.S. EPA has calculated an inhalation unit risk estimate of 5.8×10^{-5} (microgram per cubic meter)⁻¹. The U.S. EPA estimates that if an individual were to breathe air containing 1,1,2,2-tetrachloroethane at $0.02 \mu\text{g}/\text{m}^3$, over an entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified 1,1,2,2-tetrachloroethane in Group 3: Not classifiable (IARC, 1987a).

The State of California under Proposition 65 has determined that 1,1,2,2-tetrachloroethane is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 5.8×10^{-5} (microgram per cubic meter)⁻¹ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of 1,1,2,2-tetrachloroethane is estimated to be no greater than 58 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 2.7×10^{-1} (milligram per kilogram per day)⁻¹ (OEHHA, 1994).

